ANTIMICROBIAL-RESISTANT INFECTIONS IN MISSOURI

Report to the Governor and General Assembly, January 2021

Missouri Department of Health and Senior Services
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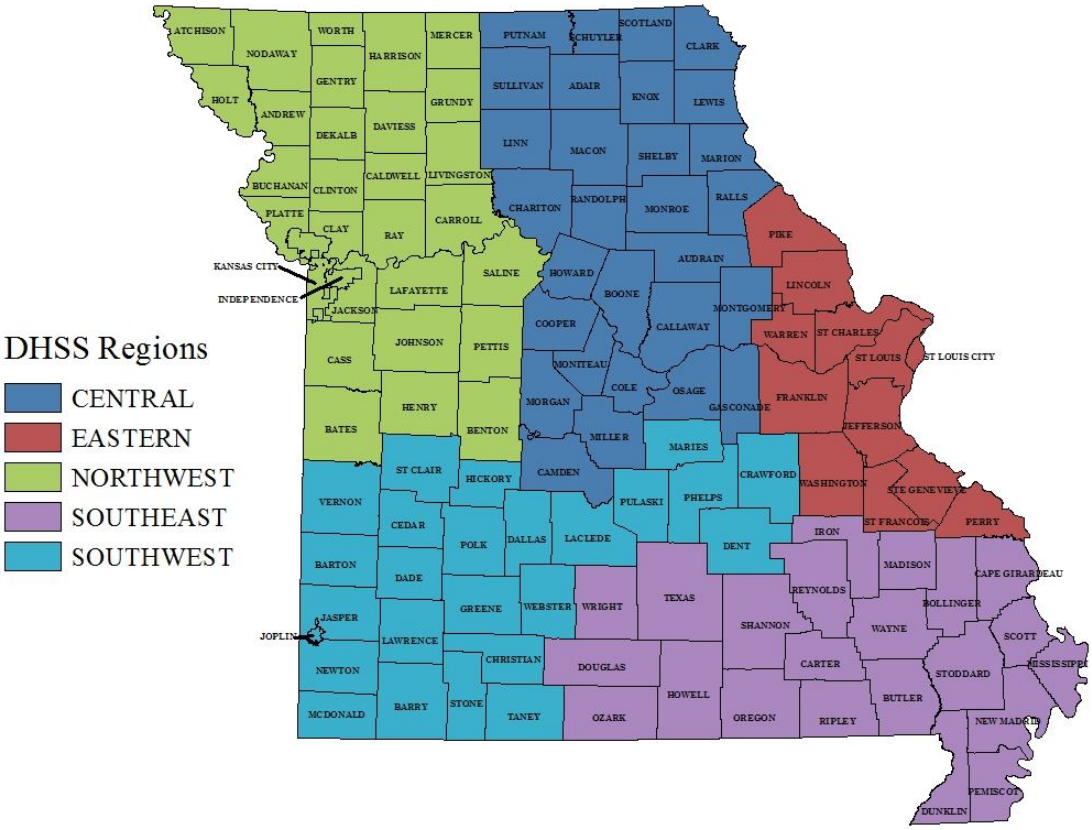
BACKGROUND

Per Section192.667.21 RSMo, passed in 2016, "The department shall make a report to the general assembly beginning January 1, 2018, and on every January first thereafter on the incidence, type, and distribution of antimicrobial-resistant infections identified in the state and within regions of the state." The data that follow are submitted to fulfill this requirement. Data sources include laboratory reports and reports by healthcare providers to the Missouri Department of Health and Senior Services (DHSS). The term antimicrobial resistance includes resistance to antibiotics, antifungals, and antiviral agents. The DHSS currently receives reports on antibiotic-resistant bacteria only.

Regions used in this report are assigned as labeled in this map:



ABOUT ANTIMICROBIAL-RESISTANT INFECTIONS

The introduction of antibiotics has greatly reduced morbidity and mortality worldwide. However, overuse of these medications has caused bacteria to develop resistance to antibiotics making infections harder and more expensive to treat. Some bacteria have developed pan-resistance, or resistance to all antibiotics. In addition, some antibiotic-resistant bacteria are able to share the genetic material that gives them the ability to resist antibiotics with other bacteria that have not developed the ability on their own. According to the "Antibiotic Resistance Threats in the United States: 2019" report by the Centers for Disease Control and Prevention (CDC), more than 2.8 million antibiotic-resistant infections occur each year in the United States and more than 35,000 people die as a direct result of these infections.[1] Antibiotic resistance is an urgent public health concern.

The time period for this report runs from Quarter 4 of 2019 through Quarter 3 of 2020 (October 1, 2019 – September 30, 2020).

[1] Centers for Disease Control and Prevention (2019). Antibiotic Resistance Threats in the United States, 2019. Retrieved from https://www.cdc.gov/drugresistance/pdf/threats-report/2019-ar-threats-report-508.pdf

HEALTHCARE-ASSOCIATED ANTIMICROBIAL-RESISTANT INFECTIONS

Hospital-acquired or healthcare-associated infections (HAIs) are infections a patient can contract while receiving healthcare in a healthcare facility. These infections may be associated with the use of invasive medical devices, surgical procedures, or gaps in infection control. The CDC estimates that on any given day, about 1 out of 31 hospital patients has at least one HAI.[2]

The "Missouri Nosocomial Infection Control Act of 2004" mandated that nosocomial methicillin-resistant *Staphylococcus aureus* (MRSA) and nosocomial vancomycin-resistant Enterococci (VRE) be included in the list of reportable diseases and/or conditions.

Carbapenem-Resistant Enterobacteriaceae (CRE) is the newest reportable condition with the passage of Senate Bill 579. The final CRE case definition was released in December of 2018.[3] Facilities began reporting CRE data in the fourth quarter of 2018.

MRSA/VRE and CRE data are reported quarterly in aggregate from 285 facilities, including hospitals and ambulatory surgery centers, throughout Missouri. It is important to note that district cases are assigned based

[2] Centers for Disease Control and Prevention (Updated 2018). Healthcare-Associated Infections-HAI Data. Retrieved from https://www.cdc.gov/hai/data/index.html

[3] Missouri Department of Health and Senior Services. (2019). *CRE Reporting*. Retrieved from https://health.mo.gov/living/healthcondiseases/communicable/communicabledisease/pdf/cre-case-definitions.pdf

on the healthcare facility address where an individual sought care rather than where they reside; therefore, these numbers do not represent the geographic distribution of these infections across Missouri. This undoubtedly results in greater case counts in districts with more healthcare facilities.

All other conditions are based on the patient's address.

Antimicrobial susceptibility results are not required to be reported for most conditions. It should be noted that these are case counts, not rates of infection throughout the State. The case counts included in this report cannot be considered as representative of all drug-resistant infections in Missouri.

It should also be noted that the SARS-CoV-2 pandemic that occurred through 2020 may have affected reporting and data collection. The data presented here may be somewhat limited based on facilities' ability to report throughout the year, as much time and many resources have had to be diverted to pandemic planning and response.

METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS (MRSA)

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a type of bacteria that is resistant to several antibiotics used to treat ordinary staph infections. Infections can range from skin infection to pneumonia to bloodstream infections.[4] The data below include positive results from all body sites monitored routinely by the reporting facilities. The body sites are not reported to DHSS, as cases are reported as a total for each quarter, and may vary by facility. Intermediate sensitivities are reported as resistant, per 19 CSR 20-20.020(13)[5].

District	Cases
Central	43
Eastern	197
Northwest	63
Southeast	11
Southwest	9
Statewide	323

[4] Centers for Disease Control and Prevention. (2019). Methicillin-resistant *Staphylococcus aureus* (MRSA): General Information. Retrieved from: https://www.cdc.gov/mrsa/community/index.html

[5] Missouri Secretary of State. Code of State Regulations, Title 19 – Department of Health and Senior Services, Division 20 – Division of Community and Public Health, Chapter 20 – Communicable Diseases. Retrieved from: https://www.sos.mo.gov/cmsimages/adrules/csr/current/19csr/19c20-20.pdf

VANCOMYCIN-RESISTANT ENTEROCOCCI (VRE)

VRE refers to bacteria in the *Enterococcus* genus that have developed resistance to the antibiotic vancomycin.[6] This antibiotic is indicated for the treatment of life-threatening bacterial infections that have been unresponsive to other antibiotics and is considered an antibiotic of last resort. The data below include positive results from all body sites monitored routinely by the facility. The body sites are not reported to DHSS, as cases are reported as a total for each quarter, and may vary by facility. Intermediate sensitivities are reported as resistant, per 19 CSR 20-20.13.

District	Cases
Central	4
Eastern	66
Northwest	61
Southeast	2
Southwest	4
Statewide	137

[6] Centers for Disease Control and Prevention. (2019). Healthcare-Associated Infections: Vancomycin-resistant Enterococci (VRE) In Healthcare Settings. Retrieved from: https://www.cdc.gov/hai/organisms/vre/vre.html

CARBAPENEM-RESISTANT *ENTEROBACTERIACEAE* (CRE)

CRE refers to bacteria in the family of *Enterobacteriaceae* (e.g. *E. coli, Klebsiella*, etc) that are resistant to carbapenem antibiotics. This class of antibiotics is reserved for severe infections, such as those that are known or suspected to be resistant to other antibiotics, and are considered to be drugs of last resort. The CDC has ranked CRE as one of the top five most urgent, high-consequence antimicrobial-resistant threats.[7]

Some CRE produce carbapenemase, an enzyme that breaks down carbapenems. These CRE, known as CP-CRE, are an emerging public health threat that require heightened surveillance and a timely follow-up investigation because they have the ability to transfer antibiotic resistance to other bacteria. CP-CRE is included in the newest reportable condition with the passage of Senate Bill 579. The final case definition was released in December of 2018.[8] Facilities began reporting CRE data in the fourth quarter of 2018.

The Missouri State Public Health Laboratory (MSPHL) began requesting and performing testing on submitted CRE isolates for carbapenemase in April of 2019, leading to an increase in the numbers of CP-CRE identified beginning in the second quarter of 2019. The case counts for CP-CRE are a subset of the total CRE numbers.

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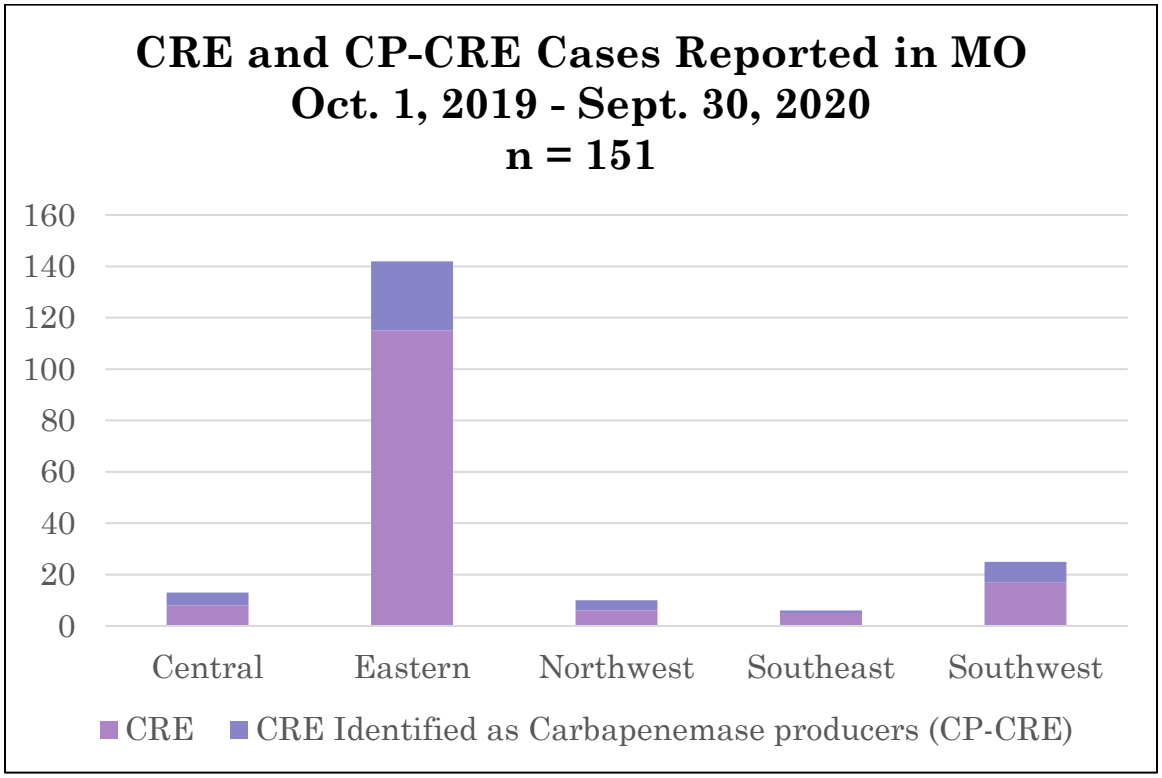
[7] Centers for Disease Control and Prevention. (2020). *Antibiotic/Antimicrobial Resistance (AR/AMR) Biggest Threats and Data.* Retrieved from https://www.cdc.gov/drugresistance/biggest-threats.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fdrugresistance%2Fbiggest_threats.html

[8] Missouri Department of Health and Senior Services. (2019). *CRE Reporting.* Retrieved from https://health.mo.gov/living/healthcondiseases/communicable/communicabledisease/pdf/cre-case-definitions.pdf

CARBAPENEM-RESISTANT *ENTEROBACTERIACEAE* (CRE and CP-CRE)

District	Total CRE Cases	CP-CRE Cases
Central	8	5
Eastern	115	27
Northwest	6	4
Southeast	5	1
Southwest	17	8
Statewide	151	45



CARBAPENEM-RESISTANT *ACINETOBACTER*

Acinetobacter is a group of bacteria found in the environment that can live for long periods of time on surfaces or shared medical equipment if they are not properly cleaned. Infections typically occur in patients in healthcare settings, especially those with wounds or indwelling medical devices such as catheters or ventilators. *Acinetobacter* can cause blood, urinary tract, lung, or wound infections. It can also live in patients without causing symptoms, but still be easily spread to others through contact with infected surfaces or person to person, often via contaminated hands.

As with other resistant bacteria, of particular concern are *Acinetobacter* that can also produce carbapenemase (CP-CRAB) and share their antibiotic resistance with other bacteria. The CDC has ranked it as one of the top five most urgent, high-consequence antimicrobial-resistant threats.[9]

	Total CP-CRAB Cases Reported
Statewide	61

[9] Centers for Disease Control and Prevention. (2020). *Antibiotic/Antimicrobial Resistance (AR/AMR) Biggest Threats and Data*. Retrieved from https://www.cdc.gov/drugresistance/biggest-threats.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fdrugresistance%2Fbiggest_threats.html

CARBAPENEM-RESISTANT *PSEUDOMONAS AERUGINOSA* (CRPA)

Pseudomonas aeruginosa is a type of bacteria that is a common cause of healthcare associated infections in the blood, lungs, or other parts of the body after surgery. Multidrug-resistant *Pseudomonas* has been designated as a serious threat by the CDC.[10] CRPA is not currently reportable, but DHSS occasionally receives voluntary reports.

The MSPHL began a sampling program in conjunction with the CDC in April of 2019 to try to assess the burden of carbapenemase producing CRPAs across the country. These are known as CP-CRPA. Facilities voluntarily submit samples and a random subset of 10 CRPA per month are tested. There were no CP-CRPA detected in this reporting period though surveillance is still ongoing.

	Total CP-CRPA Cases Reported
Statewide	0

[10] Centers for Disease Control and Prevention. (Updated 2019). *Pseudomonas aeruginosa in Healthcare Settings*. Retrieved from https://www.cdc.gov/hai/organisms/pseudomonas.html

DRUG RESISTANT TUBERCULOSIS

Mycobacterium tuberculosis is a bacterium that causes the disease tuberculosis (TB). TB disease can occur in the lungs or other sites, including the brain, kidneys, or spine and can spread from person to person through the air. Worldwide, TB is the leading cause of death from infectious disease. Drug-resistant TB is relatively uncommon in the United States when compared to developing countries, though rates are increasing.

There are two types of drug-resistant TB of public health concern: multidrug-resistant TB (MDR TB) and extensively drug-resistant TB (XDR TB). MDR TB is resistant to at least two of the most potent first-line TB drugs, Isoniazid and Rifampin. XDR TB is resistant to Isoniazid and Rifampicin, plus any fluoroquinolone, and at least one of the three second-line drugs. Treating drug-resistant TB is very costly and can take years. The average cost of treating a XDR TB case is over $500,000. Costs are even higher when loss of productivity is considered. [11]

[11] Centers for Disease Control and Prevention. (2017). Drug-Resistant TB. Retrieved from https://www.cdc.gov/tb/topic/drtb/default.htm

DRUG RESISTANT TUBERCULOSIS

District	Cases
Central	0
Eastern	1
Northwest	0
Southeast	0
Southwest	2
Total	3

NOTE: One drug-resistant culture result per patient per report period is included in the above totals. This may not necessarily be the patient's initial culture result, as TB can persist for an extended period of time. The cases reported above are resistant to at least one antibiotic and not necessarily MDR or XDR cases. Missouri has no history of XDR TB cases.

NEISSERIA GONORRHOEAE

Gonorrhea is a sexually transmitted disease that can affect both men and women.[12] According to the CDC, there are an estimated 1.14 million total cases of gonorrhea each year of which 550,000 cases are resistant to at least one antibiotic.[13] There are few antibiotics left to treat gonorrhea, and resistance to the remaining antibiotics is increasing. The CDC has categorized drug-resistant *Neisseria gonorrhoeae* as an urgent risk to the United States. An urgent ranking indicates urgent and aggressive actions are necessary to address the risk.[14]

District	**Cases**
Central	0
Eastern	1
Northwest	2
Southeast	1
Southwest	2
Total	6

[12] Centers for Disease Control and Prevention. (2014). Gonorrhea: Gonorrhea – CDC Fact Sheet. Retrieved from: https://www.cdc.gov/std/gonorrhea/stdfact-gonorrhea.htm

[13] Centers for Disease Control and Prevention. (Updated 2020). Combating the Threat of Antibiotic-Resistant Gonorrhea. Retrieved from https://www.cdc.gov/std/gonorrhea/arg/carb.htm

[14] Centers for Disease Control and Prevention. (Updated 2020). Antibiotic/Antimicrobial Resistance (AR/AMR). Retrieved from https://www.cdc.gov/drugresistance/biggest_threats.html

NEISSERIA MENINGITIDIS

Neisseria meningitidis is a bacterium that causes meningococcal disease, a severe and often deadly infection. These infections may include meningitis, meningococcemia, and sepsis.[15] Due to the severity of this disease, prompt antibiotic treatment is necessary, therefore antibiotic resistance is of concern. The CDC reports that rates of meningococcal disease in the United States are at a historic low.[16]

District	**Cases**
Central	0
Eastern	0
Northwest	0
Southeast	0
Southwest	1
Total	1

[15] Centers for Disease Control and Prevention. (2020). Meningococcal Disease. Retrieved from https://www.cdc.gov/meningococcal/index.html

[16] Centers for Disease Control and Prevention. (2019). Vaccines and Preventable Diseases Meningococcal Vaccination: What Everyone Should Know. Retrieved from https://www.cdc.gov/vaccines/vpd/mening/public/index.html#how-well-they-work

STREPTOCOCCUS PNEUMONIAE

Streptococcus pneumoniae is a bacterium that is reportable when an invasive infection occurs in a normally sterile site. The main syndromes include pneumonia, bacteremia, and meningitis and infections can be severe or even fatal[17]. According to the CDC, data shows that pneumococcal bacteria are resistant to one or more antibiotics in 30% of cases.[18]

District	**Cases**
Central	9
Eastern	38
Northwest	26
Southeast	19
Southwest	27
Total	119

[17] Centers for Disease Control and Prevention. (2017). Pneumococcal Disease: Types of Infection. Retrieved from: https://www.cdc.gov/pneumococcal/about/infection-types.html

[18] Centers for Disease Control and Prevention. (2017). Pneumococcal Disease: Drug Resistance. Retrieved from: https://www.cdc.gov/pneumococcal/drug-resistance.html

SHIGELLA

Shigella is a genus of bacteria that causes a diarrheal illness called shigellosis. *Shigella* is easily spread from person to person, including through sexual activity. Shigellosis outbreaks frequently occur in daycare centers due to suboptimal hygiene in small and diapered children.[19] Nationally, drug resistant *Shigella* cases have increased significantly since 2013.[20]

District	**Cases**
Central	0
Eastern	6
Northwest	2
Southeast	1
Southwest	1
Total	10

[19] Centers for Disease Control and Prevention. (2020). *Shigella* – Shigellosis. Retrieved from: https://www.cdc.gov/shigella/index.html
[20] Centers for Disease Control and Prevention. (2019). Drug-Resistant *Shigella*. Retrieved from: https://www.cdc.gov/drugresistance/pdf/threats-report/shigella-508.pdf

Questions:

Any questions about this report should be addressed to the Missouri Department of Health and Senior Services, Bureau of Communicable Disease Control and Prevention: 573-751-6113.